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ABSORBENT ARTICLE WITH TENSIONING ATTACHMENT
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(57) Claim

1. A disposable absorbent article defining a front waist portion, a rear waist portion and an intermediate portion between said front waist portion and said rear waist portion, said disposable article comprising:

a backsheet,

a topsheet;

an absorbent medium therebetween;

an attaching member on said rear waist portion, said attaching member having an inner surface and an outer surface and comprising a plurality of hook members or a plurality of loop members on both said inner surface and said outer surface; and

a foldable trapping panel on said front waist portion, said foldable trapping panel comprising a base panel joined to said backsheet and a flap panel foldable relative to said base panel, said base panel and said flap panel both comprising a plurality of hook members or both comprising a plurality of loop members, said attaching member being releasably engageable between said base panel and said flap panel.

ABSORBENT ARTICLE WITH TENSIONING ATTACHMENTBackground of the Invention

5 The present invention pertains to diapers, incontinence garments, and the like, and more specifically to a disposable diaper, disposable incontinence garment, and the like in which attachment is accomplished with an improved mechanical fastening system.

10 Diapers or incontinence garments generally comprise a liquid-impermeable barrier sheet, a liquid-permeable bodyside liner, and an absorbent medium therebetween. They may generally include some type of attaching system for fitting the diaper or garment to the wearer. The present invention is intended for use with these types of articles, and also with other types of articles that require some type of attaching feature; such articles being surgical gowns, and other personal care or health care garments.

15 Mechanical attachments, such as hook-and-loop systems, have been used on garments in the past. However, various limitations have prevented the widespread commercialization of these systems on disposable garments or other disposable articles. The most apparent limitations to the commercialization include the cost of the system and the functionality of that system. Typically, the cost and functionality of the system is a tradeoff. In other words, greater functionality and performance can be achieved by using more expensive materials.

20 Generally, hook-and-loop systems fail in the "peel" mode. For example, a peel mode exists when one component is held stationary, while the second component is pulled off the first component sequentially. When two attaching components, such as a plurality of hooks and a plurality of loops, are disengaged in the peel mode, the hooks and loops are progressively separated. That is, each row or line of hooks is disengaged a little at a time until all of the hooks are disengaged from their respective loops. The peel performance of hook-and-loop systems is very sensitive to the cost/performance

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ratio. Generally, to obtain higher peel, a higher basis weight loop must be used which ultimately translates to more loops, thicker fabric, and greater overall cost.

A "shear" mode failure, in comparison, exists when the two components are being pulled apart by oppositely directed forces lying in the same plane. The shear mode action 5 is a sliding, linear action, in contrast to the peel mode which is a curvilinear type of motion or action.

A "latching" mode failure exists when the two components are being pulled apart by oppositely directed forces acting generally perpendicular to the plane of the components.

Summary of the Invention

10 It is the object of the present invention to overcome or substantially ameliorate the above disadvantages.

There is disclosed herein a disposable absorbent article defining a front waist portion, a rear waist portion and an intermediate portion between said front waist portion and said rear waist portion, said disposable article comprising:

15 a backsheet,

a topsheet;

an absorbent medium therebetween;

an attaching member on said rear waist portion, said attaching member having an inner surface and an outer surface and comprising a plurality of hook members or a 20 plurality of loop members on both said inner surface and said outer surface; and

a foldable trapping panel on said front waist portion, said foldable trapping panel comprising a base panel joined to said backsheet and a flap panel foldable relative to said base panel, said base panel and said flap panel both comprising a plurality of hook members or both comprising a plurality of loop members, said attaching member being 25 releasably engageable between said base panel and said flap panel.

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Brief Description of the Drawings

A preferred form of the present invention will now be described by way of example with reference to the accompanying drawings, wherein:

- Fig. 1 is a perspective view of the back of a diaper.
- 5 Fig. 2 is a perspective front view of the diaper in Fig. 1 partially broken away.
- Fig. 3 is a cross-sectional view of Fig. 2 taken along line 3-3 and viewed in the direction of the arrows.
- Fig. 4 is a cross-sectional view of Fig. 2 taken along line 4-4 and viewed in the direction of the arrows.
- 10 Fig. 5 is a schematic of an apparatus for applying adhesive beads in a spaced-apart fashion upon a material sheet.
- Fig. 6 is a plan view of the applied adhesive beads on the material sheet.
- Fig. 7 is a graph comparing the closure force of hook-and-loop systems.
- Fig. 8 is an enlarged side elevational view illustrating the attachment of a loop
15 material on a substrate.
- Fig. 9 is an enlarged side elevational view of the loop material in Fig. 8 in a buckled, tensioned state.



Fig. 10 is a perspective view of the back of a diaper.

Fig. 11 is an enlarged side elevational view illustrating the closed position of the attaching system illustrated in Fig. 10.

Fig. 12 is a graph comparing the closure force of a hook-and-loop system without a
5 trap feature and a hook-and-loop system incorporating a trap feature.

Fig. 13A is an enlarged side elevational view illustrating a hook-and-loop system in
a conventional untensioned state.

Fig. 13B is an enlarged side elevational view illustrating a hook-and-loop system in
a tensioned state.

10 Fig. 14 is a graph illustrating increases in latching forces as tension is increased on
the system.

Fig. 15 is a graph comparing improved mechanical fastening for different hook
types under varying tensions.

15 Fig. 16 is an illustration of equipment used with the described latching test
procedure.

Detailed Description

Although it is contemplated that the present invention is operable in a baby diaper, child's training pant, adult incontinence products, and other personal or health care products, the present description 5 will be made in terms of a baby diaper for ease of explanation and illustration.

Referring to Figs. 1-4, diaper 2 generally comprises backsheet 4, topsheet 6, and absorbent medium 8 therebetween. Leg elastics 10 are 10 joined to side margins 12 of diaper 2 in order to gather or shirr at least intermediate portion 14 of diaper 2. Diaper 2 further comprises a front waist portion 16, rear waist portion 17, and ear portions 18 that are generally integral with rear waist portion 17. As can be seen in Figs. 1 and 2, intermediate portion 14 has a more 15 narrow width than front and rear waist portions 16, 17, thereby giving diaper 2 a generally hour-glass shape. In Fig. 1, the arrow designated L represents the length dimension of diaper 2 and the machine direction in the manufacture of diaper 2, and the arrow perpendicular thereto designated as T indicates the width of 20 diaper 2, as well the cross direction of the diaper during the manufacturing process.

Front waist portion 16 includes ear sections 20 which have disposed therebetween loop panel 22, which comprises the loop component of the hook-and-loop system. Loop panel 22 can be a fabric material manufactured to have a raised loop construction in which the fabric is stabilized, i.e., the individual loops are erect from the fabric's base, through a napping treatment. Panel 22 can also be any suitable material having non-woven loops thereon. Loop panel 22 is attached 25 to front waist portion 16 of backsheet 4 such that the loops extend outwardly therefrom. The geometric shape of loop panel 22 can be any desired shape, such as rectangular, irregular, diamond, triangular, circular, oval, chevron, or the like. As illustrated, loop panel 22 is generally rectangular in shape.

Referring to Figs. 1-6, loop panel 22 is bonded or attached to backsheet 4 in a manner that is unique and results in enhanced mechanical attaching, specifically increasing the peel, shear, and latching strengths of the attaching system. Rather than bonding the entire undersurface of loop panel 22 to the surface of backsheet 4, only discrete or predetermined sections of panel 22 are attached or bonded to backsheet 4, thereby leaving portions of loop panel 22 unattached and free to move relative to backsheet 4. By thus controlling the bonding or attaching pattern of loop panel 22, the peel, shear, and latching properties of the hook-and-loop system are significantly enhanced, as graphically illustrated in Fig. 7.

Referring specifically to Figs. 5 and 6, a roll of loop material 24 is unwound from reel 26 and passed below hot melt die 28 that is in fluid communication with hopper 30, which contains a hot melt adhesive. The hot melt adhesive is applied by running loop material 24 under die 28 which applies spaced-apart beads 32 of adhesive onto loop material 24 in the machine direction, as illustrated by the arrow in Fig. 5. Since beads 32 are spaced apart, they naturally form spaces 34 therebetween.

The apparatus in Fig. 5 further includes a cutting device 36 including blade 38, which is reciprocated downwardly to cut a plurality of loop panels 22 from loop material 24.

The adhesive beads 32 range in their width from about 1 millimeter to about 15 millimeters, and the width of each space 34 is generally in the range from about 1 millimeter to about 30 millimeters. In one preferred embodiment, beads 32 are 3 millimeters in width, and are spaced about 3 millimeters apart, i.e., spaces 34 have a width of about 3 millimeters. Loop panel 22 is then attached to backsheet 4 between ear sections 20, as illustrated in Fig. 1.

As illustrated in Figs. 5 and 6, adhesive beads 32 are applied in a parallel, linear fashion, but the present invention contemplates application of adhesive beads 32 in any desired pattern as long as

the resulting application produces spaced-apart areas of adhesive, such as beads 32.

Referring to Figs. 1-4, 8, 9, each ear portion 18 includes a hook tab 40 extending outwardly thereon and including a plurality of hook members 42 for engaging a plurality of loop members 44. As illustrated in Fig. 3 and Fig. 9, each individual hook member 42 can face a single direction. However, the present invention contemplates that the hook members 22 can be oriented in two or more directions. For example, a first predetermined set of rows of hook members 42 could face inwardly, as illustrated in Fig. 3, while other predetermined remaining rows can have their hook members 42 facing in an opposite direction. Alternatively, individual ones of hook members 42 can be oriented 10 in any different number of directions as required.

Hook members 42 can have any desired geometry or shape, and can be made of any suitable material. Hook members 42 can be made of a nylon material, or of materials represented in Fig. 15 as unidirectional HTH 706, HTH 707, or HTH 708 that can be purchased from Velcro Industries B.V., Amsterdam, Netherlands or affiliates thereof.

15 Shapes of members 42 can be hook-, mushroom-shaped, or any other desired shape. Hook member density on a respective hook tab 40 is generally within the range of about 30 to about 160 hooks per square centimetre, and preferably about 115 hooks per square centimetre. Each hook tab 40 also may have a row density within the range of about 3 to about 30 rows per lineal centimetre of width, and preferably a row density of about 15 20 rows per lineal centimetre. Naturally, these ranges of hook density and row density can vary and be dependent upon the peel and shear characteristics of the type and geometry of material used.

The position or placement of the hook members and loop members on their particular garment or article may be interchanged.

Referring now to Fig. 8, there is illustrated an enlarged side elevational view of backsheet 4 having attached thereto loop panel 22 and its loop members 44 by the spaced-apart adhesive beads 32. Between beads 32 are spaces 34 in which loop panel 22 is unattached to backsheet 4. Upon enlarging a respective hook tab 40 to loop panel 22 such 5 that hook members 42 engage loop members 44, and upon application of a tension as illustrated by the arrow in Fig. 9, loop panel 22 will distort or flex with a plurality of buckles 46. This generally results in an increase in the peel, shear, and/or latching strengths between hook tabs 40 and loop panel 22. As graphically illustrated in Fig. 7, graph line C illustrates the closure force of a conventional hook-and-loop system in which 10 the loop panel is totally adhered to its substrate. In contrast, graph line I illustrates the increase in closure force provided by the present invention in which loop panel 22 is intermittently or discretely attached to its backsheet 4. Without being bound to any specific theory or mechanism, it has been found that the increase in peel, shear, and latching strengths results from intermittent attachment of loop panel 22 to backsheet 4, 15 thereby forming a plurality of buckles 46 when hook tabs 40 are engaged under tension to loop panel 22. A preferred tension range is between about 50 grams per inch to about 500 grams per inch.

Referring now to Fig. 10, diaper 48 is identical to diaper 2 except in the following description. Each ear portion 18 has joined thereto hook tab 50 having a plurality of hook 20 members 42 disposed on both inner surface 52 and outer surface 54 of a respective hook tab 50. Generally, hook tab 50 can be made of a stretchable or elastomeric material, or hook tab 50 can be joined to a respective ear portion 18 by an intermediate strip of stretchable or elastic material that joins hook tab 50 to ear portion 18.

Front waist portion 16 of backsheet 4 has disposed thereon two separate loop panels 25 56, 58. Since loop panels 56, 58 are identical, a description of only loop panel 56 will be made. Loop panel 56

includes loop panel base 60 joined to backsheets 4 and loop panel flap 62 which is hingedly connected to loop panel base 60, as illustrated in Fig. 10. This permits loop panel flap 62 to be folded back and forth between a generally unfolded position, in which it is substantially coplanar with loop panel base 60, and a folded position, in which it is folded over and on top of loop panel base 60 such that their respective loop members 44 are in mutually facing relationship.

10 Referring to Figs. 10 and 11, upon placing diaper 48 about the wearer, each ear portion 18 is drawn around the waist section of the wearer and a respective hook tab 50 is stretched, i.e., placed under tension, as necessary for a proper fit, and placed against loop panel base 60 to engage hook members 42 on inner surface 52 with loop members 44 of loop panel base 60. Loop panel flap 62 is then folded over and engaged with hook tab 50 such that loop members 44 of loop panel flaps 62 engage hook members 52 on outer surface 54 of hook tab 40. Although Fig. 11 illustrates hook members 52 as having their open or mouth ends oriented in the same direction, hook members 52 may be multiply directed as required to provide the desired attachment.

15 Referring to Fig. 12, graph line A represents the closure force of a conventional hook-and-loop system without a loop panel flap, and graph line P illustrates a system in which loop panel flap 62 and loop panel base 60 trap hook members 52 of hook tab 50.

20 Referring to Fig. 13A, a conventional hook-and-loop system in an untensioned state is illustrated. Because of the untensioned state, there is a certain amount of looseness or play between individual hooks and loops that can result in a less than desirable fastening system. In contrast, Fig. 13B illustrates the hook-and-loop system of the present type in a tensioned state that causes the hooks to be engaged firmly without play with their respective loops. This increases the stability and performance of the fastening system.

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For example, Figs. 14 and 15 illustrate the increase in latching forces for hooks made of different materials as tension is increased. Thus, regardless of the hook material or article with which the fastening system of the present application may be used, tension enhances the performance of all systems to some degree.

Test Procedures

PEEL TEST PROCEDURE

Peel is determined according to ASTM Designation D1876-72, "Standard Test Methods for Peel Resistance of Adhesives (T-Peel Test)", subject to the following modification: No test panels are used; hook-and-loop materials are directly engaged and are not mounted on any other substrate unless specified. Test direction of the materials should be noted. No panels are used. The engaged test materials are rolled five cycles; where one cycle equals once in each direction. The hook material is clamped into the upper jaw and the loop material is clamped into the lower jaw.

SHEAR TEST PROCEDURE

Shear is determined according to ASTM Designation D3654-82, "Standard Test Method for Holding Power of Pressure-Sensitive Tapes", and which is subject to the following modification: In relation to the test, the closure is placed under an increasing load. The system being tested is a hook-and-loop closure system. The apparatus should include an "INSTRON" or equivalent tensile tester. In carrying out the procedure, test direction of the materials should be noted. The test materials are rolled five cycles (one square inch), where one cycle equals once in each direction. The hook material is clamped into the lower jaw of the INSTRON tensile tester. The engaged system (hook-and-loop) is pulled until failure. In doing calculations, the peak load is determined and recorded in grams.

- 5 While this invention has been described as having preferred embodiments, it will be understood that it is capable of further modifications. This application is therefore intended to cover any equivalents, variations, uses, or adaptations of the invention following the general principles thereof, and including such
- 10 departures from the present disclosure as come within known or customary practice in the art to which this invention pertains and fall within the limits of the appended claims.



The claims defining the invention are as follows:

1. A disposable absorbent article defining a front waist portion, a rear waist portion and an intermediate portion between said front waist portion and said rear waist portion, said disposable article comprising:

- 5 a backsheet,
- a topsheet;
- an absorbent medium therebetween;
- an attaching member on said rear waist portion, said attaching member having an inner surface and an outer surface and comprising a plurality of hook members or a
10 plurality of loop members on both said inner surface and said outer surface; and
- a foldable trapping panel on said front waist portion, said foldable trapping panel comprising a base panel joined to said backsheet and a flap panel foldable relative to said base panel, said base panel and said flap panel both comprising a plurality of hook members or both comprising a plurality of loop members, said attaching member being
15 releasably engageable between said base panel and said flap panel.

2. The article of claim 1 wherein said attaching member comprises a plurality of hook members and said base panel and said flap panel both comprise a plurality of loop members.

3. The article of claim 1 wherein said attaching member comprises a plurality of
20 loop members and said base panel and said flap panel both comprise a plurality of hook members.

4. The article of claim 1, 2, or 3 wherein said hook members are oriented in one direction.

5. The article of claim 1, 2, or 3 wherein said hook members are oriented in
25 multiple directions.

6. The article of claim 1, 2, or 3 wherein said attaching member is stretchable.

7. The article of claim 1, 2, or 3 wherein said rear waist portion further comprises ear portions, said attaching member being joined to said ear portions.

8. An absorbent article substantially as hereinbefore described with reference to
30 Fig 10 of the accompanying drawings.

Dated 9 October, 1995
Kimberly-Clark Corporation

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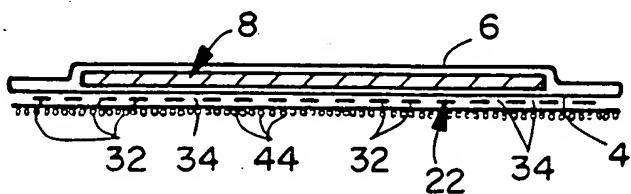
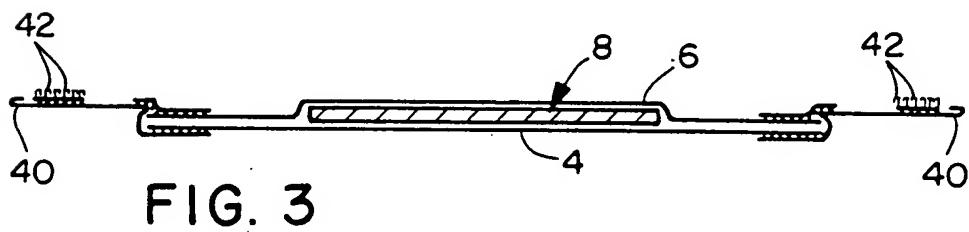
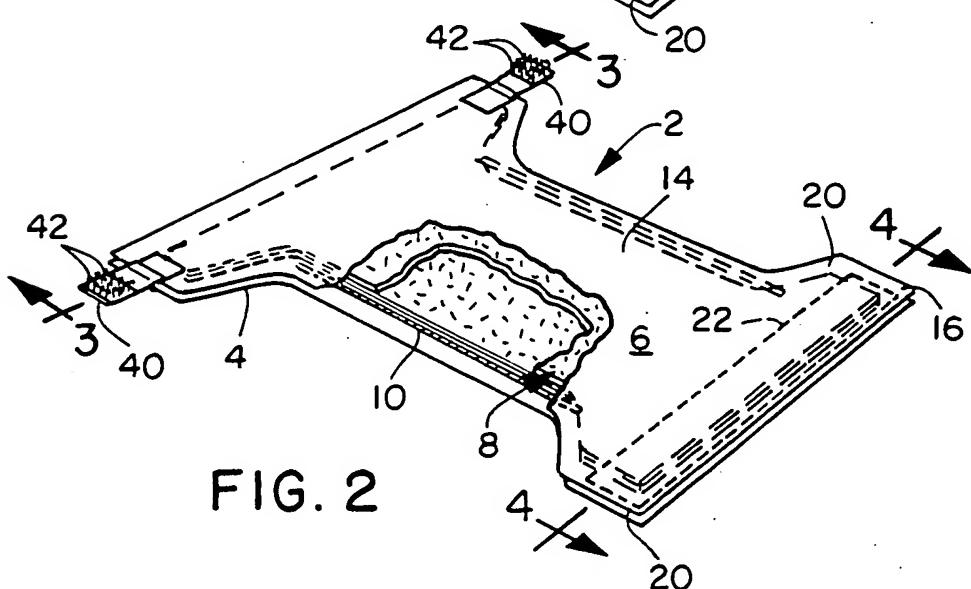
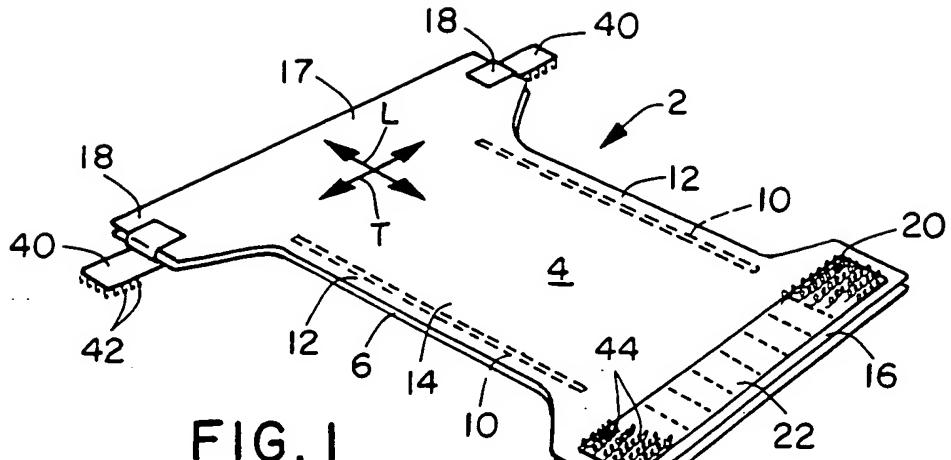


ABSORBENT ARTICLE WITH TENSIONING ATTACHMENT

Abstract

An absorbent article such as a diaper further comprises a foldable trapping panel on said front waist portion (16) said foldable trapping panel comprising a base panel (60) joined to said backsheet (4) and a flap panel (62) foldable relative to said base panel (60).
5 The attaching member (50) is releasably engageable between the base panel (60) and the flap panel (62).

10 Figure 10



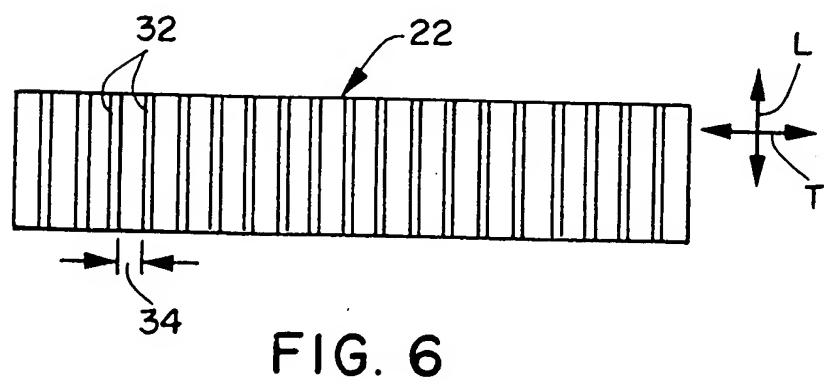
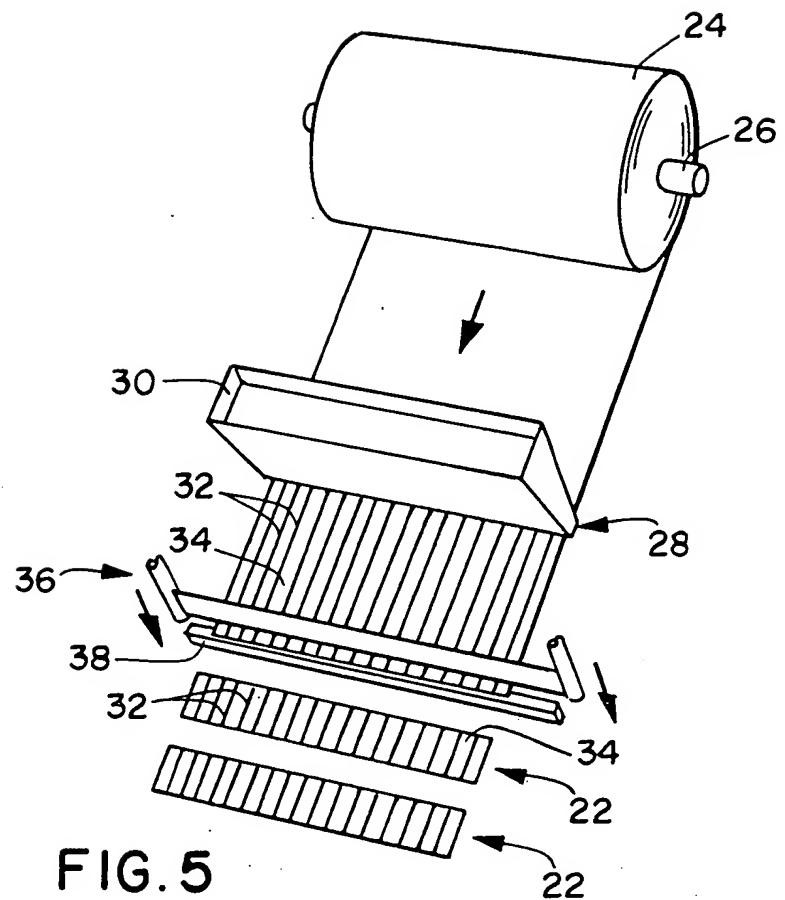
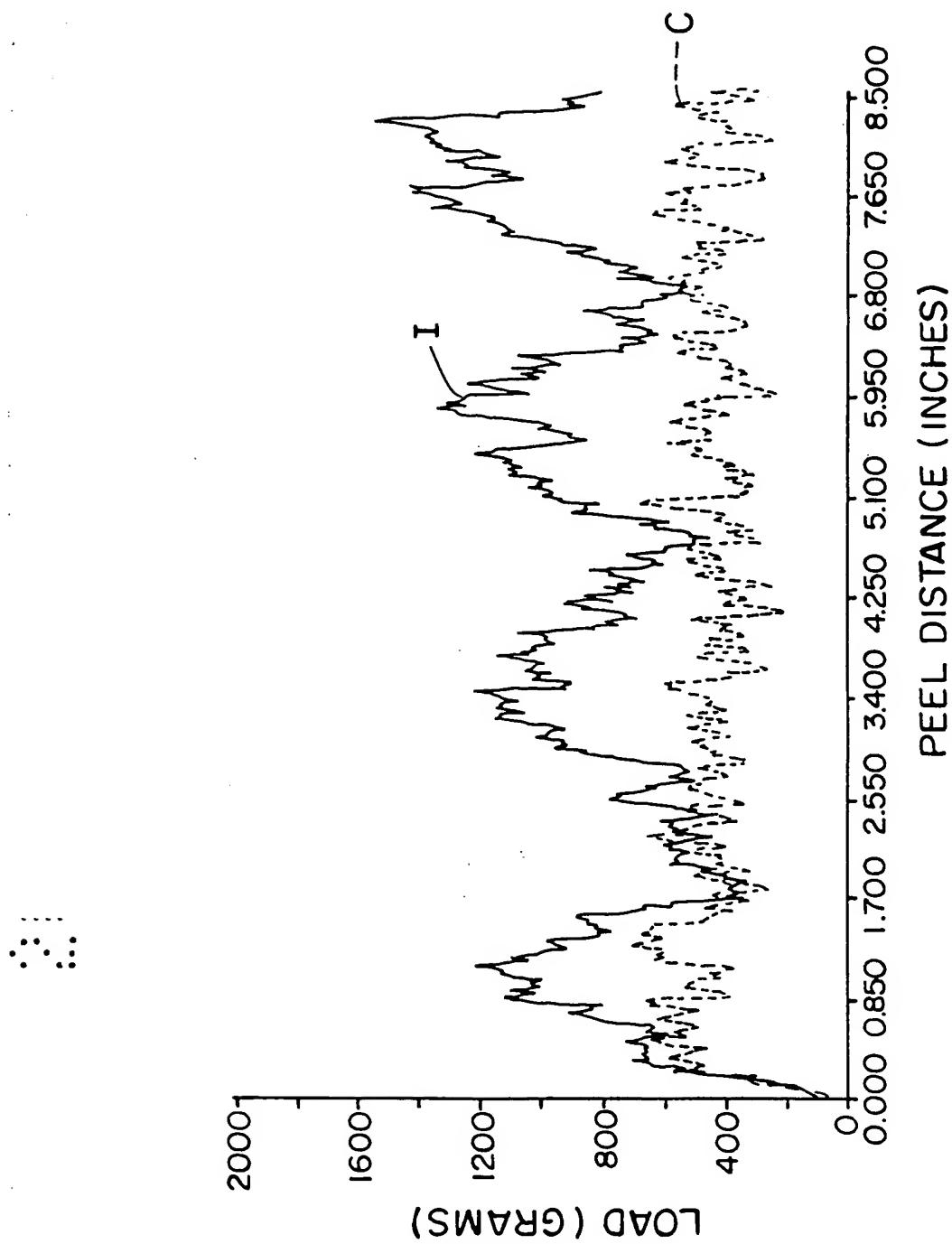


FIG. 7



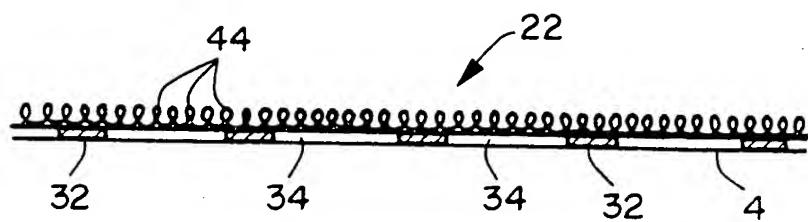


FIG. 8

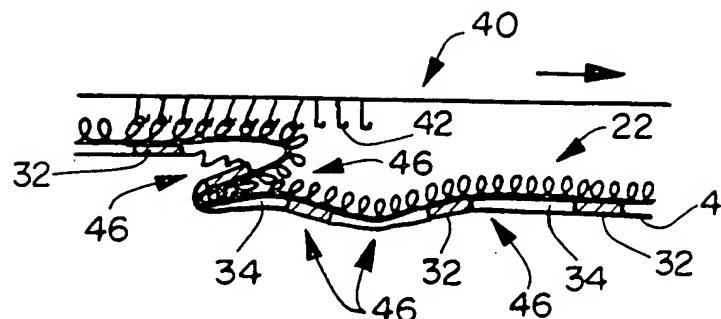


FIG. 9

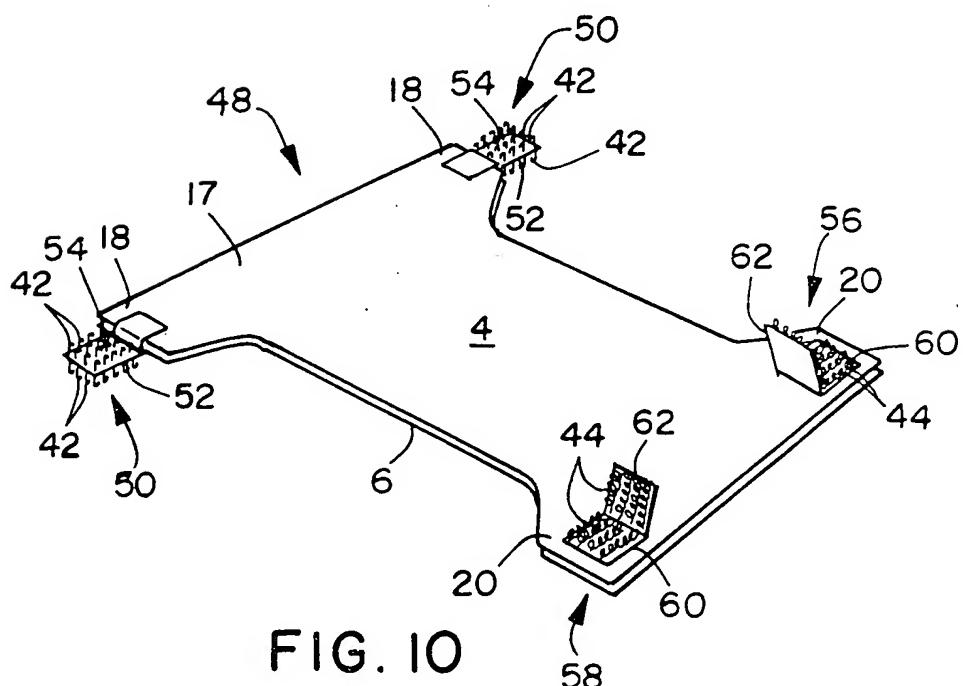


FIG. 10

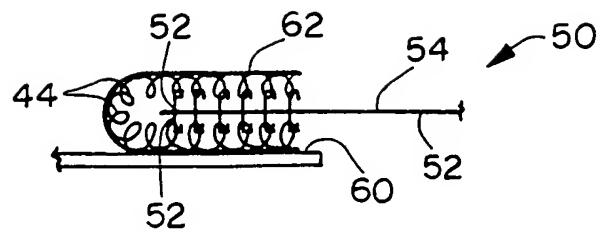


FIG. 11

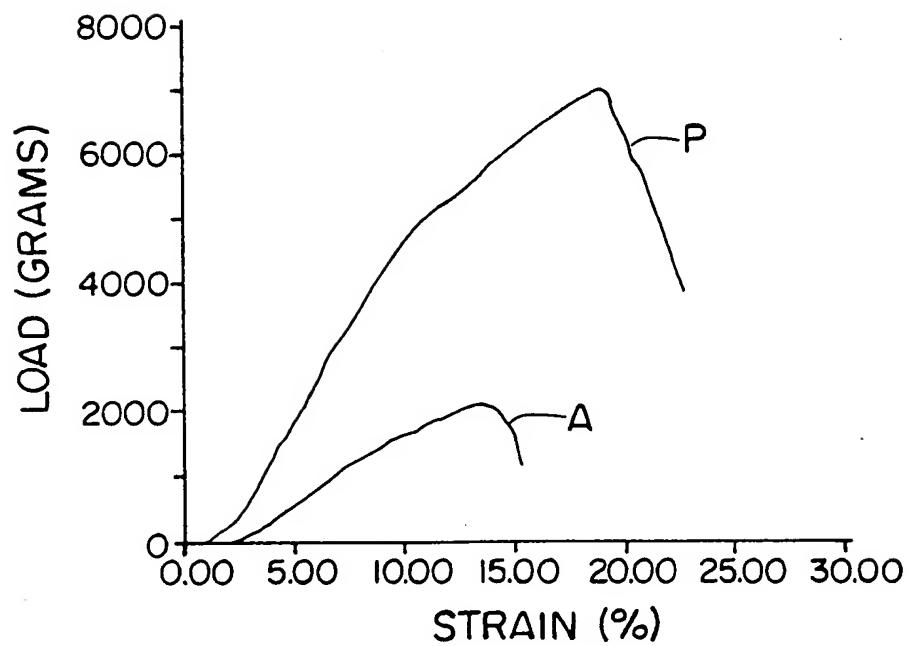


FIG. 12

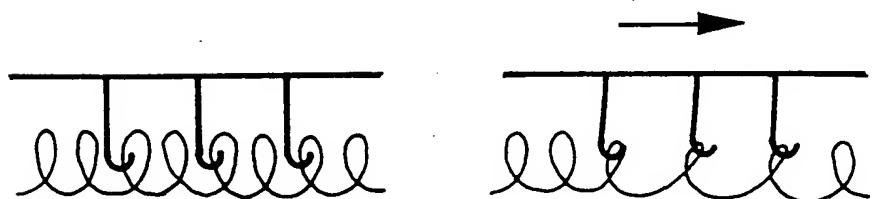


FIG. 13A

FIG. 13B

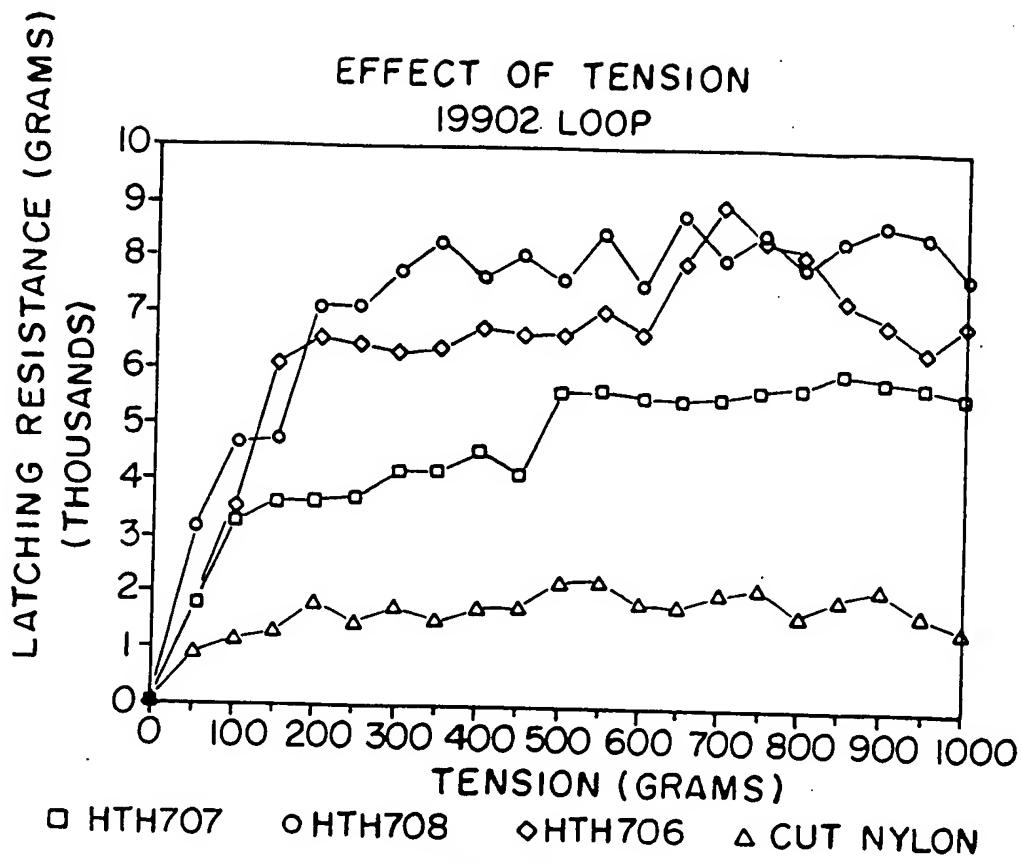


FIG. 14

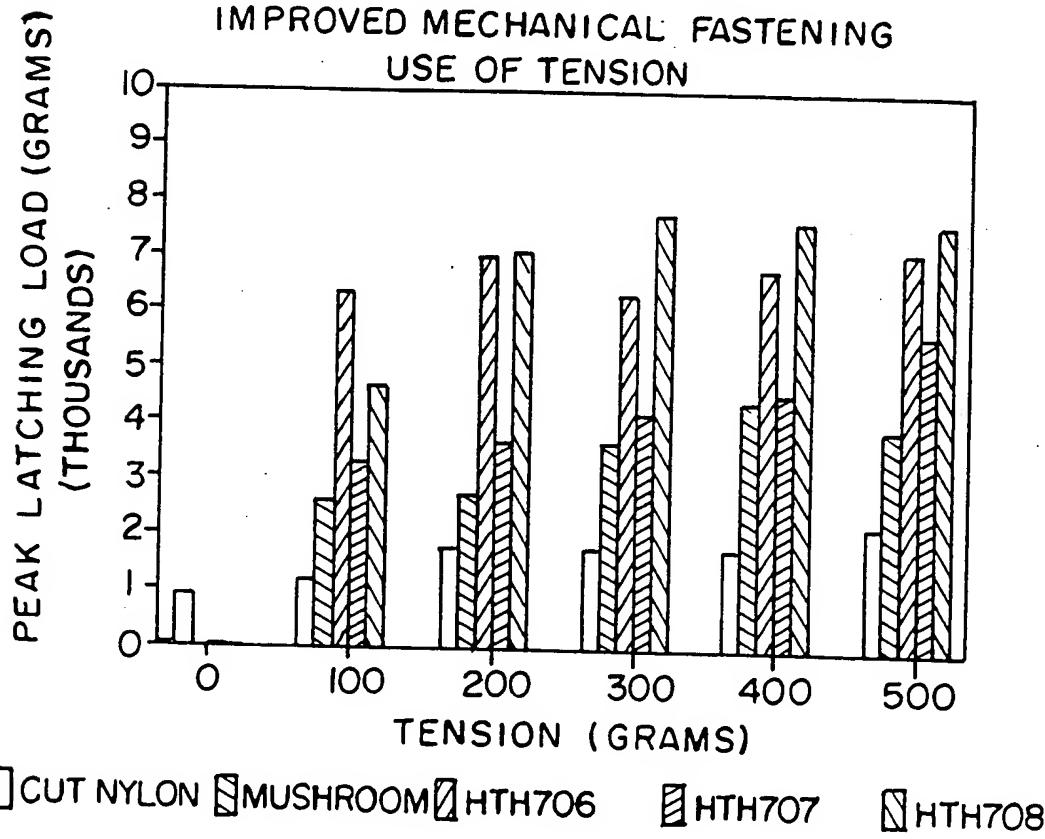


FIG. 15

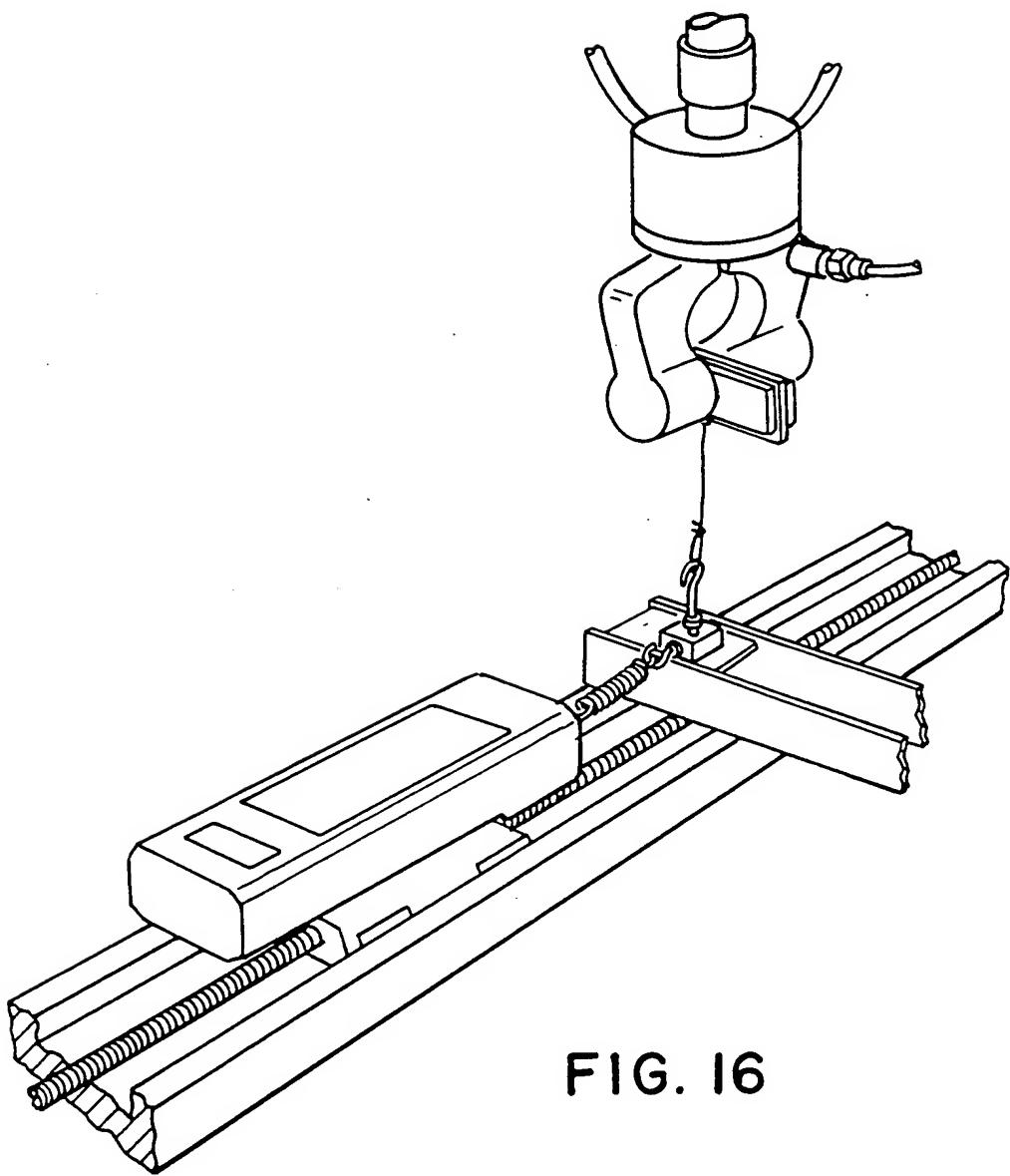


FIG. 16

